

THE STRUCTURE, AFFINITIES AND SPECIES OF SCOLOPENDRELLA.

BY JOHN A. RYDER.

Inasmuch as a notice,¹ published by me in the *American Naturalist* for May, 1880, has awakened renewed interest in relation to these singular types, and because the ordinal division proposed by me for their reception has apparently been accepted by Dr. Latzel² in his revision of the Austro-Hungarian species of *Myriapoda*, I venture to offer the results of my studies for the use of those interested. Since the publication of my notice above referred to, I have met with a paper unknown to me at the time mine was written, which in many respects anticipates the observations made by the writer, and relied upon as characters of ordinal value. The publication here alluded to is entitled "Myriapoden der Umgegend von Danzig"³ by Menge, in which the author discusses at length the anatomy of the *Scolopendrella immaculata* Newp. From his plates and text I find that, while he confirms my observations in many respects, in others his interpretations conflict with mine. Not only is this the fact with regard to my observations, but also with those of others who have studied the genus. Taken as a whole, the monograph of Menge is, however, by far the most valuable which has yet appeared.

The following synopsis of Menge's observations will, I think, be found useful. I will preserve as nearly as possible the phraseology of the German text, which has reference to *S. immaculata*.

"Head compressed, ovoid, little longer than wide; antennæ 40-42, articulate, inserted immediately behind the labrum, the joints compressed fusiform, urn-shaped, the basal ones thicker than long, becoming gradually longer towards the tip, so that the apical joints are more than twice as long as thick; terminal joint acorn-shaped. Each joint is encircled at its middle by a circle of outwardly divergent hairs. . . . Behind the insertion of the antennæ, at the sides, are two little prominences on the epicranium and alongside and above them on each side is placed a round black eye, visible only under the microscope.

¹ "Scolopendrella as the type of a new order of Articulates (Symphyla)."

² R. Latzel, "Die Myriapoden der oesterreichisch-ungarisch Monarchie. Erste Hälfte. Die Chilopoden," pp. 228, Pls. 10, 8vo. Vienna. 1880.

³ Neueste Schriften der naturforschenden Gesellschaft in Danzig, IV, 4tes Heft, 4to. 1851.

“Mouth parts arranged for biting. Labrum forming the anterior portion of the epizanium, and divided into two rounded extremities anteriorly by a mesial emargination, both halves terminated by three pairs of teeth directed towards each other. Mandibles beneath labrum, somewhat exerted, one jointed, elongate, curved inwards, the outer side finely pubescent, the apex armed with four large and five small, hard, brown teeth. Maxillæ two-jointed, basal joint cylindrical, curving slightly inwards, surmounted by two apical pieces, the outer, longest and most slender piece may be regarded as representing a palpus, while the inner one, which is shorter, terminating in a series of bristles, may be regarded as the second joint of the maxillæ. The labium is an oblong plate divided in the middle by a suture. The anterior margin of each half bears three conical teeth.

“The body consists of twenty-three somites; twelve principal ones, to which the legs are attached, and ten smaller intermediate and a caudal somite. Each principal or leg-bearing somite has a quadrate sternum which is divided in the middle into two halves by a median furrow; the narrower intermediate somites have an elongate, undivided sternum, while the sides are covered by a triangular chitinous piece. . . . Attached to every leg-bearing somite except the first, behind and alongside of the insertion of the legs are a pair of simple, hairy appendages. The anal opening is on the ventral side of the body covered by a rhomboidal almost semicircular plate, the lateral extremities of which extend somewhat beyond the edges of the last dorsal scute. The dorsal surface is covered by fifteen scutes which are slightly imbricated. The hind margins of the scutes are but slightly emarginated. . .

“Legs in twelve pairs, or three less than the number of dorsal scutes: no pairs of legs corresponding to the fifth and eighth dorsal and the caudal scutes. The first pair of legs are the smallest, and including the tarsal joint, are four-jointed. The fourth joint is the longest, the tarsal the shortest. The latter is simply a little conical prominence on the outer face of which there are attached two hooked claws. . . .

“The conical caudal appendages are simply an efferent apparatus connected with two long caecal pouches which are filled with a viscous spinning material. The efferent duct ends between two terminal bristles.

“Besides the dorsal and sternal scutes there are pairs of liga-

mentous bands which join the terga and sternae; in the hinder somites these bands are joined together dorsally and form an arch. The anterior ones are joined medially below by lateral processes. They also exist in the head.

"The digestive apparatus consists of a straight canal which extends from the mouth to the anus. The pharynx passes between the ligamentous bands of the upper cephalic plates. The oesophagus is provided with annular folds and longitudinal and annular muscles. The stomach is decidedly widened and consists of an elongated cylindrical sac and is covered with brownish hepatic cells; these cells have finely granular contents. There are no cilia on the inner surface of the stomach or alimentary canal. The stomach is usually of a yellowish brown color because of the contained food, which consists of particles of brown mould or humus, which could not be taken in by a sucking apparatus. The cavity of the small intestine is very much more contracted than that of the stomach, and at its commencement four vermicularly coiled malpighian tubules open into it.

"Immediately above the anus lies the opening of the oviduct and ovary, the latter consisting of a simple cylindrical canal with thin transparent walls. Eggs in different stages of development may usually be found therein.

"I did not see the male sexual organs, as all of the specimens dissected were females.

"I was not able to study the nervous system satisfactorily. From the head a simple cord passes backwards, which has scarcely noticeable ganglionic swellings at every somite, from which simple pairs of nerves pass to the legs.

"The vascular system consists of a simple straight canal just below the dorsal scutes beginning just behind the head and passing backwards to the caudal appendages where it divides, each branch ending blindly in the latter. The presence of valves in the dorsal vessel, trachea or tracheal openings was not revealed by an amplification of 450 diameters with a Nobert microscope of fine quality.

"The function of the ventral and caudal appendages is not certainly known. I have on several occasions found specimens of *Machilis* which had eggs attached to the caudal styles, and I have supposed that these appendages in *Scolopendrella* have the same use. If a needle is brought into contact with the tips of either of these appendages at the opening of the spinning organ a long

thread may be drawn out. It is believed that this spinning apparatus is used in fixing or attaching the eggs of the animal.

“The pairs of legs and the number of joints in the antennæ are variable. I found but eleven pairs of legs and seventeen joints in a young animal. The first pair of legs was wanting. In other specimens with twelve pairs of feet I found twenty-five, in others thirty-two, and in others still, forty-two joints in the antennæ. the last seems to be the number in full-grown specimens.” . . .

In conclusion our author observes that, “It will have been concluded from what has been said, that *Scolopendrella* is distinguished from *Lithobius* as well as from *Geophilus* by the very different manducatory apparatus, the double tarsal claws, the ventral and the caudal appendages with the spinning apparatus, and that it does not naturally fall into the same family with either of those genera. On the contrary the animal agrees in its principal characters (excepting the spinning organs) and especially in its habits with *Campodea*; is distinguished from it, however, by the greater number of pairs of legs and the dorsal scutes. I believe, accordingly, that *Scolopendrella* may be regarded as the type of a genus or family intermediate between the six-footed *Lepismidæ* and the *Scolopendridæ*.”

The foregoing paragraph shows how very nearly Menge had concluded thirty years ago that these singular animals should be separated from the Myriapods proper. The parallel between his conclusions and my own are very striking, as will be seen from the following words from my notice already alluded to. “This form, as interpreted above, becomes of the highest interest to the zoologist, and if the writer is not mistaken, the biunguiculate legs and their nearly complete correspondence in number with rudimentary abdominal and functional thoracic limbs of the *Thysanura*, especially *Machilis* and *Lepisma*, which also have basal appendages to the legs, indicate as much affinity with insects as with myriapods, and may indeed be looked upon, perhaps, as representing the last survival of the form from which insects may be supposed to have descended. I name the new group *Symphyla*, in reference to the singular combination of myriapodous, insectean and thysanurous characters which it presents.”

Our conclusions as to its zoological position being nearly the same, upon the details of the anatomy we disagree. I stated in my note my interpretation of the ventral openings on the third or

fourth body segment. (The first condition occurs in immature specimens with less than twelve pairs of legs, the last in adults). "Genital orifice of the ventral side of the body opening on the third or fourth body-segment in both sexes. In one sex the opening is a simple pore, in the other a longitudinal cleft, closed by means of an oblong chitinous piece on either side, the two together occupying a sub-quadrate space. Heart dorsal; tracheal system represented by a series of simple tubular arches, without a spiral filament, which arise from openings on the ventral surface of the animal, inside the bases of the legs, widening and passing upwards to and apparently in close relation with the dorsal vessel. Intestine straight, with two very long, tortuous Malpighian tubules opening into it at the posterior third (*S. notacantha*)."

The main points of disagreement are in regard to the position of the genital organs and the supposed tracheal arches. Menge states that the oviduct opens posteriorly and above the anus, and claims to have seen the eggs in the latter and the ovary. As to this point, I did not confirm his observations, although I do not deny that he may have seen real ova. Nor do I now affirm positively that the ventral opening seen by me is genital; the only evidence being the circumstance that I found two kinds in different individuals. Its function may be that of the ventral sucker of *Collembola*. Menge also says he saw no males, which is a curious fact. His statement that the caudal stylets will adhere to a sharp point brought into contact with their tips, I can confirm, and I have also seen a thread drawn from them in *S. notacantha*. He is confident that what I took for tracheal arches are simply chitinous rods or ligaments which serve to join the sterna and the scutes. He is mistaken, however, when he affirms that the posterior ones form a continuous arch, since in all the specimens examined by me the arch was broken at the dorsal vessel, the widened ends of the opposite halves of the arches seeming to lie against its sides. The walls of these arched tubes showed double contours under the microscope, which proves them to be hollow.

He also finds four Malpighian tubules in *S. immaculata*, whereas I find but two in *S. notacantha*. He finds as few as seventeen joints in the antennæ to as many as forty-two. I find from fourteen to twenty-eight in two species. Newport,¹ speaking of the species studied by Menge, finds the joints of the antennæ to vary

¹ Monograph of the Class Myriapoda, Order Chilopoda. Trans. Linn. Soc. XIX, pp. 349-439, 1 Pl. 1845.

from twelve to twenty-eight, and finds specimens of different ages with nine, ten, eleven and twelve pairs of legs. This variability in the number of pairs of legs I have noticed in both the American forms studied by myself. Newport also at first thought the creature was nearly related to *Geophilus*, but afterwards placed it between *Lithobius* and *Scolopendra*, but he at last considered it the type of a family, a conclusion which Gervais¹ did not accept. Wood² says he never saw any specimens of the family, and gives the characters assigned by Newport.

The first species described was by Gervais in 1839, from specimens found in the environs of Paris. This species was made the type of the genus. In his description he disagrees with Menge in the distribution of the legs. This may however be on account of the difference of the species.

Order SYMPHYLA.

Amer. Nat. XIV, p. 375-6.

Head, antennæ and mouth parts thysanuriform. Trachea as tubular arches without spiral filament. Spiracles within the bases of the legs. An orifice on the ventral side of the body opening on the third (young) or fourth (adult) body-segment; present in some individuals as a pore, in others as a longitudinal cleft, closed by means of an oblong chitinous piece on either side, the two together occupying a subquadrate space. Two Malpighian tubules (four Menge). Legs five-jointed, terminated by a pair of claws. Ventral appendages at the bases of each pair of legs except the first. Caudal stylets containing spinning glands which open at their tips. Ovary lying dorsad of the rectum (Menge).

FAMILY SCOLOPENDRELLIDÆ.

Newp. Transac. Linn. Society, XIX, p. 374.

SCOLOPENDRELLA Gerv.

Comptes Rendus, 1839.

- S. notacantha* Gerv. Aptères, IV, 201, Pl. 39, fig. 7; Ann. Sci. Nat., Zool. II, 1844, p. 70, Pl. 5, figs. 15-17; Ryder, Am. Nat., p. 375, 1880. Hab. France and ? Pa. and Md.
- S. immaculata* Newport. Trans. Linn. Soc. XIX, pp. 373-374, Pl. XL, figs. 4, 4a, b, c; Menge, Neuste Schr. d. naturf. Gesell. Danzig, IV, 1851, Pls. 2, Hab. England and Germany.

¹ Aptères. Suite à Buffon, Walckenaer et Gervais, t. IV, p. 301-303. Paris, 1847.

² Monogr. North American Myriap., Trans. Am. Philos. Soc., XIII. New Series, 1869.

S. americana Paekard. Proc. Bost. Soc. Nat. Hist., XVI, p. 111, 1873. Name only.
Hab. Salem, Mass.

S. gratiæ Ryder. Am. Nat., XIV, p. 375, 1880. Name only.

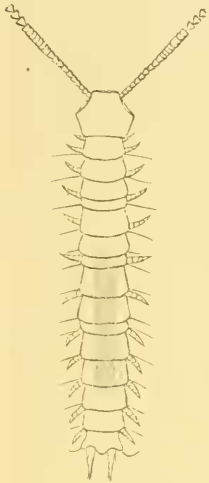


Fig. 1.—*S. gratiæ*.
Enlarged 25 times.

This species (Figure 1.), may be distinguished from *S. immaculata* by the presence of a pair of stout hairs which diverge outwards from the sides of the body at each segment. Head wider than body, not cordate but sub-pentagonal from above. A single pair of eyes on the sides of the head behind the antennæ. not visible from above. Antennæ twenty-one-articulate. Length 2 to 2.5 mm. Habitats: Fairmount Park, Philada; Havre de Grace, Md.; Washington, D. C.; Franklin Co., Pa. Under stones, sticks and in damp mould.

I dedicate this handsome species to my sister.

S. microcolpa Muhr. Zoolog. Anzeiger, IV, 1881, pp. 59-61, figs. 1, 2 and 4.

Is near *S. notacantha*, but is said to have no ventral appendages at the bases of the legs. I would remark, however, that in the specimens thought to be *notacantha*, I find these appendages present, but they are extremely small and may easily be overlooked. Muhr's paper is a valuable contribution however to the anatomy of the mouth parts of a form near the species first described. Habitat, Prague, Bohemia.

Figure 2, representing an American specimen of the same, or nearly the same, as *S. notacantha*, has a very suggestive resemblance to *Japyx* in the shape of the body; whether this is more than a resemblance I forbear to suggest. No doubt now remains in my mind that dissimilar as *Lepisma*, *Machilis*, *Lepismina*, *Nicoletia*, *Campodea* and *Japyx* at first appear upon comparison with each other, their principal characters suggest in

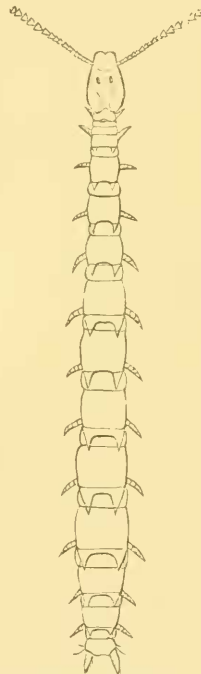


Fig. 2.—*S. notacantha*.
Enlarged 25 times.

the most forcible manner, an affiliation with *Scolopendrella*. This is most strongly indicated in the mouth parts, legs, variability in the number of antennal joints and habits of life in all of which *Scolopendrella* exhibits the strongest resemblances to the *Thysanura*, with very marked affinities to the Myriapods as well. The position of the ovary is that in *Geophilus*, but spinning organs are also characteristic of the male *Geophilus* and *Polydesmus*; a female specimen of the latter, while being kept in confinement, spun a web about its eggs in a jar in which I had confined it. I never noticed that any American female *Geophilus* spun webs about their nests, though I have frequently encountered masses of their beautiful amethystine-colored eggs, over which they kept faithful watch.

Whether the proposed order *Symphyla* is sufficiently well characterized may be a matter of doubt; this can only be decided by a more elaborate investigation of its anatomy, which the writer hopes to be able to carry out at no distant day.